

EDITORIAL ARTICLES.

GLEISS ON NERVE SUTURING.

AN interesting report has just been made by Gleiss on the eleven cases of nerve suturing in Bruns' clinic in Tübingen from 1882 till 1891.¹ The first four of these were primary operations, done on the same day or the day following the injury; the remaining seven were secondary operations. The excellent results obtained in these cases entitle them to a more general publication. In only one did union fail to occur.

Thirteen nerve suturings were done upon eleven patients. The median nerve was sutured five times; once in the upper half of the arm, thrice in the forearm near the wrist joint, and once in the palm. The ulnar nerve was sutured three times; once in the upper part of the arm, once just below the olecranon, and once just below its point of division. The radial nerve was sutured four times in its extreme upper portion. The peroneal nerve was once sutured at the knee.

The technique pursued was after a new method invented by Prof. Bruns. Of course, in the healing of a sutured nerve it is of the greatest importance that no neuritis, the result of septic infection, be set up; and the healing in all of these cases was entirely free from septic reaction.

In the primary suturings no freshening of the nerve ends was necessary. In the cases of secondary suturing, usually the two ends were diagonally freshened, and often the cicatricial tissue between removed. In one such case, in which the divided ends were connected by a cicatricial mass, a longitudinal incision through the middle of the cicatrix and extending on either side well into the

¹ Beiträge zur klin. Chirurg., Band x, Heft 2, 1893.

nerve substance was made; and this converted into a transverse line by sutures passed through the nerve in such a way as to bring the nerve tissue in contact with nerve tissue, as shown in Figs. 1 and 2.



FIG. 1.—Showing longitudinal incision through cicatrix, extending into normal nerve substance on either side.

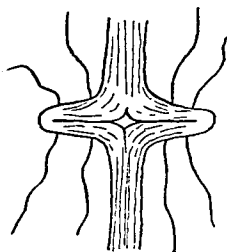


FIG. 2.—Showing incision in Fig. 1 united transversely.

In three other cases the bulbous central end was split up into the normal nerve substance by a single longitudinal incision, and the distal end beveled to a wedge-shape, and sutured into the split

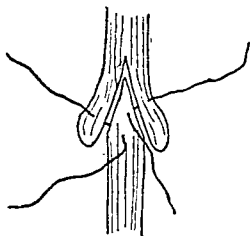


FIG. 3.—Showing nerve stumps united by the wedge method.

central end, as shown in Fig. 3. Two of these cases gave perfect results, but one had to be subjected to a second operation before function was restored.

In another case the divided ends of the ulnar nerve were separated to the extent of 10 cm., so that a direct union was impossible. This difficulty was overcome by splitting off a flap from the proximal segment, and bridging over the space by suturing one end of it to the distal segment. This did not completely effect a cure, though there was some restoration of function.

The method of applying the sutures varied with the circumstances; usually two direct and one or two indirect sutures were employed. No other material than catgut was used. In order to prevent the sutured portion from being compressed by new connective fibrous tissue, in four cases the nerve was protected in a decalcified bone tube which became gradually absorbed.

Restoration of function not having been improved by one of the operations on the median nerve, the seat of suture was cut down upon after eleven months, and a tumor, a neuroma, the size of a bean, was found at the seat of operation. A second operation was done, the nerve enclosed in a bone tube, and a perfect restoration of function resulted. The neuroma did not recur.

In another case the radial nerve had been torn through by a fracture of the humerus, and reunited by suture. At the end of five months there was no restoration of function; the nerve was exposed and found imbedded in cicatricial tissue. It was liberated and enveloped in a graft of skin after the method of Thiersch, to prevent a repetition of this strangulation.

After these operations the limbs were put up in such a position as to bring as little tension as possible upon the nerve. As soon as the wounds were healed massage was carefully initiated, and in conjunction with it electricity was employed and continued as long as possible.

The results in these cases were almost invariably good. Thirteen different nerves were sutured, and all were healed with one exception. This was the case in which there was a separation of 10 cm., and also division of the brachial artery.

Etzold² has observed that "in high nerve wounds the prognosis,

² Etzold, *Klinische Untersuchungen über Nervennaht*, Dissertation, Dorpat, 1889.

notwithstanding the nerve suture, is unfavorable." He reports six cases of nerve injury in the axilla and extreme upper part of the arm, in which, notwithstanding primary nerve suturing and other treatment, the results were poor. He holds the high position alone responsible, although in all of these cases the axillary or brachial arteries, and usually also the veins, had to be ligated, thereby greatly interfering with the nourishment of the whole extremity. Extensive division of the surrounding soft parts was also present, which gave rise to an unusual amount of scar tissue.

Furthermore, it is interesting to observe that in these cases of reunited nerves the conductivity of cerebral impulses became established before the nerve was capable of transmitting the electric impulse. In one case motility was established fourteen months after the suturing, while electrical tests continue to give negative results. Motion returned in another case after twelve months, though the electrical reaction was scarcely perceptible.

An interesting observation made by Gleiss in his cases was that even when a nerve had been completely divided, the skin area supplied by that nerve, did not, in all cases, lose its sensibility. In one case of division of both median and ulnar nerves, in which the ulnar did not heal, there was absolutely no disturbance of sensibility for the first two years after the injury; while four years after the injury, when the median wound had been healed, the sensibility in the ulnar region became almost obliterated. Ziegler¹ states that "regeneration is almost complete by the end of the third month." The full return of function, however, requires a year or over. The following is a table of duration of healing in Gleiss' cases as far as they were observed:

¹ Lehrbuch der pathologischen Anatomie.

Suture of	Sensibility first observed after	Motility first observed after	Electrical response first observed after	Healing established after
I Median and Ulnar	2 months	3 mo., 10 days	.....	5½ years
II Median	16 days, none	16 days, none	16 days, none	4½ years
III Median	Always normal	18 days, none	.....	2 years
IV Radial	Always normal	1 month	12 mo., weak	12 months
V Radial	Always normal	2½ months	24 days faradic	1 year
VI Radial	16 days	3 months	2 mo., 16 days	6½ years
VII Median	1 month	2 mo., 11 days	.....	2 years
VIII Median and Ulnar	Always present	1 mo. (median)	.....	20 mo. (median)
IX Peroneal	1 month, 5 days	2 mo., none	.....	14 months
X Radial	Always present	1 mo., 5 days	1 year, uncertain	14 months
XI Ulnar	25 days	2 mo., none	8 months	8 mo., improvement

It is impossible to say whether or no there is a difference in the time of healing between the primary and secondary operations. In these cases the time elapsing between the operation and the return of function was very variable.

The question as to whether a nerve can heal *per primam intentionem* is still *sub judice*. Wolberg¹ has made a number of experiments to discover whether a divided nerve can be made to heal without the peripheral segment undergoing degeneration. In all of his experiments degeneration took place. And in these four cases of Gleiss' of primary suture, although the ultimate results in all were good, still in none was there an immediate restoration of function.

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¹ Deutsche Zeitschrift für Chirurgie, Band XIX.